In all cells, respondents will be permitted to sit or stand wherever they like in the room. The room will be brightly lit, typical of a living room or electronics store. Respondents will see clips all the way through, and will then answer the questions. The clips will continue running while respondents are answering questions. After answering purchase intent, respondents should be asked a series of questions about the content of the clips they have seen.

REQUEST FOR PROPOSALS

FCC Planning Subcommittee Working Party 7 -- Audience Research

RFP 2 -- TECHNICAL STUDY

September 1989

I. Purpose

The scope of this research is to measure consumer responses to several *attributes* of advanced television systems, the *types of programs* most appreciated in advanced television formats, and the *types of viewers* who most appreciate advanced television systems. The research will involve consumer exposure to actual display equipment and appropriate source programming under conditions which are as natural as possible and mimic home viewing conditions.

The results from the research are to be used by the FCC to assess currently proposed systems which modify NTSC (the current U.S. terrestrial television transmission standard) to provide enhanced television signals.

II. Introduction

There are a number of proposed advanced television (ATV) systems which propose various improvements over the current National Television Systems Committee (NTSC) television standard. Proposed ATV systems offer several kinds of consumer benefits that include higher definition picture and/or wider aspect ratio. Since the FCC has specified that ATV systems for terrestrial broadcast must be compatible with existing NTSC sets, each system involves a particular set of trade-offs.

Most of the trade-offs systems make have been chosen by video experts who have spent their career in a darkened room staring at high quality video signals. It is essential that the trade-offs also be tested with consumers; what consumers choose and what experts choose may not be the same! Systems designed solely by experts may not lead to the system consumers prefer.

III. Questions to Answer

We are interested in assessing how consumers respond to several of these benefits (e.g., aspect ratio, resolution, and trade-offs between spatial and temporal resolution), as well as how sensitive preferences are to program material (e.g., drama, sports, game shows), source of program material (i.e., film versus video), viewing distance from the display, and screen size of the display.

Much of the previous research has dealt with what the eye can detect, not what makes a substantial difference in consumer appeal. This research is to investigate, in a simulated home setting (if possible), consumers' responses to the variables just discussed. As stated in the introduction, we are interested in how much people appreciate the benefits as well as how evaluations are influenced by factors such as programming and display devices. If at all possible, we would like to characterize viewers who most appreciate ATV.

IV. Variables to Investigate

The variables below are included because they are attributes of ATV or they are variables which previous research indicates might have a strong influence on preferences. Each variable will be described in more detail below.

SUMMARY OF KEY VARIABLES

- **Progressive (P) versus Interlaced Scan (IS)** -- (1050 I vs. 525 PS, 1050 I vs. 525 I)
- **Spatial versus temporal resolution trade-offs** (two or three representative conditions)
- **Transmission degradation** (2-4 conditions)
- **Aspect ratio** (4:3, 16:9, perhaps 5:3)
- **Screen size** (e.g, direct view -- 26" or 35"; projection -- very large)
- **Type of programming** (e.g., sports such as football and soccer, news, drama, sitcom, action/adventure)
- **Source material** (film, video)
- **Room conditions** (e.g., viewing distance -- "home" distances of 6-12 feet; lighting)
- **Screen conditions** (e.g., brightness, user controlled settings)

Scanning and spatial resolution versus temporal resolution

Given a channel bandwidth, what do you send? Images which look great when they are still, but blur in motion? Better motion rendition, but less details in stills? What is important to most people (not just what they can discriminate!)? One clear design trade-off is between interlaced scan (as used in the current NTSC system) versus progressive scan. For example, interlaced scan sends half the picture every sixtieth of a second (better motion rendition) whereas progressive scan send the picture every thirtieth of a second (better spatial rendition). To our knowledge, no one has ever consumer tested trade-offs between spatial and temporal resolution. Two possible tests are 1050-interlaced vs. 525 progressive scan (with bandwidth held constant); and 1050-interlaced vs. 525-interlaced (how much preference is there for double the bandwidth?)

For other spatial versus temporal trade-offs, many alternatives are possible; there is no simple reduction to a few variables. Things to consider are: luminance versus color rendition, differing frequency bands of resolution, and filters to enhance trade-offs. While it is not practical to test every combination, a selection of two or three representative conditions beyond interlaced versus progressive scan will yield useful information.

Transmission degradation

Although it is widely assumed that the showroom is a worst case for signal quality, there is experience, based on surveys of representative homes in major metropolitan areas, that indicates otherwise. In most homes, the antenna, the lead-in cable, the connections and the television alignment are in poor condition. These factors result in significantly lower signals at the set than would be calculated from field strength estimates alone. To accurately predict people's willingness to purchase ATV, we need to compare signals which will look like typical signals in the home. "Typical" could include poor signal level, channel noise, Gaussian and impulse noise, ghosts, intermodulation effects, cable effects, non-linear effects, and the list goes on. Again, we can't test everything; a selection of two or three degradation conditions would yield some information on the kinds of effects degradation has on consumer evaluations of ATV systems.

Aspect ratio, screen size, screen brightness

Aspect ratio is one attribute on which ATV systems differ, therefore, one for which we would like to measure both preferences and degree of preferences. Likewise, some people feel that the attractiveness of an ATV system is strongly dependent on screen size. Even though aspect ratio and screen size will be investigated in other studies, we would like to examine them in this study for several reasons. First, we would like to gather preferences in a home setting. Second, previous research (e.g., RCA and MIT) indicates preferences for wide aspect ratio and for much larger screen sizes. We would like to include both factors, both to compare this research to other studies and to investigate the influence aspect ratio and screen size have on the other variables we are testing.

The comparison for aspect ratio should be 4:3 versus 16:9. There may be some interest in testing 5:3. We propose to make all comparisons by holding the number of lines constant and sacrificing horizontal resolution (wider aspect will have less horizontal resolution) so pixels or channel bandwidth are held constant. For the displays we should compare either equal area images (equal light to the eye) or equal diagonal images (equal cost of manufacturing a tube) rather than the images where 4:3 and widescreen are the same height.

For screen size, we should use a large direct-view (e.g., between 26" to 35") as well as a large projection system (e.g., Barco projector). For screen brightness, attempts should be made to generate high resolution images which are bright (special projectors?) if at all possible; dimmer images are easier to come by.

Type of programming and source material

Program content is extremely important; how people respond to systems can change drastically based on content. Which program types are most appropriate for advanced television systems is one of the largely unanswered questions. If at all possible, this research should be conducted with sample programs from all the major genres, e.g., news, graphics, sports, action, drama, comedy. Unfortunately, the availability of high quality, broadly-based programming is not as extensive as we would like. Program content should be as broad as possible given current constraints of availability. (We are assuming that no source material would be developed for these tests, but that we would have access to all currently available high definition material, including specially developed material for Working Party 6 on Subjective Assessment.)

Since film and video look different, it is highly desirable to use both film and video as source material. Again, the availability may restrict options here; video availability in 1050 proscan or 525 interlace is extremely limited.

Viewing distance and room lighting

Viewing distance and room lighting should be as much like home viewing as possible. Therefore, we propose to have viewing distances set a typical home viewing distances, rather than in terms of picture heights, for instance, 6' and 12'. We suspect that high resolution displays will appear very washed out in normal room lighting. To measure this effect, we suggest testing at both normal lighting as well as low lighting.

V. Mechanics of Selecting the Sample and Running the Test

The sample should be a representative sample of the U.S. population of television owners on age, sex, education and income (or several major regions of the U.S. which could be projectable to the entire country). To get better information about first-time buyers of advanced television systems, oversampling potential high-end buyers is possible, but in the main, the sample should be representative of all television set owners, not just high end.

Standard demographic information should be collected as well as video habits, such as what television equipment is owned, how much television is watched, how often people go to a movie theater, and any other related questions indicating video habits. Minimum cell size should be 30 to 50 people with a total in-tab sample size for the entire test of about 1,000 individuals. Using statistical design of experiments to structure the test in strongly encouraged.

Side-by-side presentation is preferred. Both displays must be matched as closely as humanly possible; factors which must be matched include, but are not limited to: color temperature, black level, white level, contrast and brightness. To measure possible differences between display units, signals should be switched, so that the wide aspect ratio or interlaced scan does not always appear on the same display device. Furthermore, one

must carefully calibrate machinery when producing tapes of test material, to avoid biasing results due to equipment differences.

In analyzing results, it is best to use several statistical techniques. Binomial confidence intervals for percentages (preferences), Chi-square tests of independence, multi-dimensional scaling, log-linear modeling, and general linear models complement each other and provide differing insights on the test results. Each technique makes different mathematical assumptions about the data, none of which are always true, therefore, it behooves one to analyze the data from several perspectives.

We recommend limiting the test to 30 minutes. The test should be carefully constructed to avoid bias due to the order in which alternatives are presented, with blocking preferred over randomization. Opinions should be collected at several points during the test, not just at the end, with consideration given to automated equipment for measuring responses. Since the wording of test questions is very important, the questionnaire and testing procedure should be extensively pretested. We feel it is important to collect price sensitivities (as an indicator of preference), preferences, degree of preferences, and ratings of picture quality.

REQUEST FOR PROPOSALS

FCC Planning Subcommittee Working Party 7 -- Audience Research

RFP 3 -- IN-DEPTH STUDY

September 1989

I. Purpose

The FCC soon will consider what technical standard it should adopt for a prospective new U.S. nationwide advanced broadcast television service. The new service initially would supplement the current broadcast television service, for which the technical standard is now the U.S. National Television Systems Committee (NTSC) television standard. The new service eventually may replace the current service and standard.

More than twenty organizations have proposed prospective standards, or concepts regarding standards.

Of the proposed standards, most offer an image which is finer defined, has a wider aspect ratio, has improved uniformity of chrominance reproduction, and has one or more other kinds of consumer benefits. Most will produce a rendition of motion different than that produced by NTSC, perhaps better, perhaps not. For most, display of the image at larger scale than prevalent today will be advantageous for the viewing distances prevalent today.

Trial broadcasting of advanced television has begun in only one nation, Japan, where approximately an hour of programming is being transmitted each day, using one of the prospective alternative standards. While receivers, players and displays for this service are being released to various organizations in Japan for public demonstrations of the service, equipment is not yet being released to residential consumers. Furthermore, no Japanese source yet has announced plans to broadcast or otherwise deliver to a diverse consumer sample, any services using the competing standards, except one of the lower-performance standards. Thus no comparative revealed preference data regarding alternatives vital to the U.S. yet are available from Japanese consumer samples. Nor are such data likely to become available soon from Japan.

Some research to determine opinions of U.S. consumers regarding the attribute mixes of a few of the alternative systems already has been undertaken, as has some research to determine consumer willingness to purchase. The research which is solicited here is intended to complement the research previously undertaken, and also to complement additional research currently being solicited in affiliated RFPs.

The preference and willingness opinion data which have been obtained to date were derived from only brief exposures of early programming to various sample of consumers. The sample consumers had opportunity to view the programming typically much less than an hour. The information which will be obtained from the additional affiliated research similarly will be derived from brief exposures. Industry analysts desire to obtain opinion derived from extended exposures, preferably with programming designed for extended exposure.

For this RFP, the sample consumers will have the opportunity to view the sample

programming for an hour or more each day, for many days, weeks, or perhaps months. The sample programming is to comprise, to the extent feasible, only program sequences appropriate for extended exposure.

The sponsors of this research anticipate that the data collected will influence the decisions of the FCC and of the industry.

II. Work to be Performed

Scope of work

The scope of the research solicited in this RFP is limited to obtaining opinions of sample consumers regarding the benefits and costs they perceive regarding one or more alternative prospective advanced-technology television services, and associated receiving and display equipment.

The sample consumers are to be exposed to sample display equipment and sample source programming while in viewing environments which are as close as possible to household viewing environments.

For this RFP, the sample consumers will have the opportunity to view the sample programming for an hour or more each day, for many days, weeks, or perhaps months. The sample programming is to comprise, to the extent feasible, only program sequences appropriate for extended exposure.

Work Tasks

1. PLAN -- As part of its proposal, bidder will submit a work plan and schedule encompassing the work tasks below. Upon award of contract, each two months contractor will prepare and submit to the sponsor an updated printed work plan and schedule, describing in detail the efforts to be undertaken. This will include plans for:

    a. obtaining rights to display the sample programming to the sample of consumers.

    b. electing, from among the prospective alternative standards, which standards are to be used for display of the sample programming.

    c. converting the sample programming to the standards elected.

    d. obtaining receivers or players, and displays, for display of the sample programming.

    e. selecting the sample of consumers.

f. establishing the viewing environment.

g. delivering programming to displays.

h. recording intervals when programming is viewed.

i. conducting interviews of sample of consumers.

2. RIGHTS -- As part of its proposal, bidder will submit a preliminary plan for identifying (i) what scope, quality, and amount of advanced television programming potentially will become available for display to the sample of consumers during the planned period of the research; (ii) who will be the owners of rights to this; (iii) for what price, if any, the owners likely will allow the programming to be used in the research; (iv) what constraints, if any, they will impose on viewing periods or conditions. From the programming the bidder deems likely to be available, as part of its proposal bidder will submit a preliminary plan for scheduling display of this programming for each respondent (or to each test site, or other factor critical to the overall plan bidder proposes), and an estimate of the cost likely to be incurred by the sponsor.

3. STANDARDS -- As part of its proposal, bidder will submit a preliminary plan for selecting the standards to be tested. WP7 prefers that each respondent be exposed to programming in at least two standards, preferably by moment-to-moment selection by the respondent between two or more broadcast, cable, or player channels, but alternatively by month-to-month selection by respondent or by the sponsor.

4. CONVERTING -- As part of its proposal, bidder will submit a preliminary plan for converting available programming to the standards to be used, and an estimate of the cost likely to be incurred by the sponsor.

5. EQUIPMENT -- As part of its proposal, bidder will submit a preliminary plan for obtaining receivers or players, and displays, for display of the sample programming, and an estimate of the cost likely to be incurred by the sponsor. WP7 prefers that all the respondents be exposed to programming displayed at high brightness at both about 18 inch vertical aperture, and about 36 to 48 inch vertical aperture. Displays capable of providing both sizes of image are available, but interfaces to the displays may not be.

6. RESPONDENTS -- As part of its proposal, bidder will submit a preliminary plan for selecting a sample of consumers to be respondents. The sample should include representation from all consumer market segments expected to become consistent major purchasers of advanced television services and equipment during the first decade after initiation of service in the U.S. If bidder does not propose a random sample of U.S. consumers, which the sponsor recognizes is likely, bidder should indicate how it proposes to weight the representation from each segment.

One possible sample which WP7 requests all bidders to consider is those persons who reserve and guarantee payment for shelter at resident-inn type hotels for prospective periods of weeks to months.

7. ENVIRONMENT -- As part of its proposal, bidder will submit a preliminary plan for establishing the environment for viewing, and an estimate of the cost likely to be incurred by the project sponsor.

8. DELIVERY -- As part of its proposal, bidder will submit a preliminary plan for delivering the sample programming to the respondent, and an estimate of the cost likely to be incurred by the sponsor.

9. RECORD -- As part of its proposal, bidder will submit a preliminary plan for recording intervals when programming is viewed.

10. INTERVIEWS -- As part of its proposal, bidder will submit a preliminary plan for conducting interviews of respondents. The interviews will include questions regarding the following; (i) respondent's awareness of the image quality differences (specifically, in what words do respondents express what differences they observe or remember, if any, between familiar NTSC images and the advanced television images); (ii) respondent's valuation of benefit regarding these differences (specifically, respondent's likely future [un]willingness to purchase services of the quality experienced, and to acquire equipment to accommodate such services, as stated sample service and equipment prices); (iii) how awareness and valuation vary with technical standard, image size, respondent age, composition and chromaticity of image, rate of image change, and type of program (particularly type of plot).

Deliverables

Each month contractor will conduct a briefing for those invited by the sponsor, outlining the work plan and schedule, describing the efforts completed, describing data obtained, and assessing findings to date.

At a date to be agreed during contract negotiations, contractor will issue a draft final report treating fully all aspects of the effort. Within one month the sponsor will furnish contractor with a list of additions and/or changes which are deemed desirable. Within one month further, contractor will revise the draft to incorporate those changes which in its professional opinion it finds substantiated by the data it obtained. The sponsor then may issue the report.

Resources to be applied

WP7 recognizes that it or other sponsors may become engaged, with assistance from contractor, in negotiations for grants or purchase of rights to programming, and for grants of use or for rental of programming standards conversion facilities, of receiving, player, and display equipment, of display sites, perhaps of transmission facilities, and perhaps of opinion, demographic, or other data.

WP7 suggests that each bidder delineate what agreements for resources of the above types contractor anticipates WP7 or other sponsors will negotiate.

WP7 recognizes that some bidders may be prepared to contribute rights to important resources. WP7 suggests that each bidder delineate what rights bidder is contributing within the price bid, particularly for resources bidder deems distinctive.

III. Selection of Contractor

Performance proposed

Accepted proposals will be ranked in order of benefit to be derived from performance of the effort proposed by bidder, as perceived by an evaluation committee to be named by WP7 or the project sponsor.

Experience from comparable undertakings

EXPERIENCE -- Professionally recognized experience in television consumer research.

SCALE OF UNDERTAKING -- Conduct of research entailing integration of the diverse resources and activities proposed here.

ORGANIZATIONAL RESOURCES -- Organization having access to numerous personnel trained in supply of all resources proposed here.

Price and any warrantees of performance

Most bidders likely will elect to provide a fixed price for all work items, subject to provision by sponsor of some critical resources, not otherwise available.

Some bidders may be prepared to provide a fixed price not only for all work items, but also including provision by bidder of much or all of the critical resources. Bids which include provision by bidder of significant critical resources for many tasks will be treated as being priced at a fixed price reduced by whatever value the sponsor deems attributable to the critical resources.

REQUEST FOR PROPOSALS

FCC Planning Subcommittee Working Party 7 -- Audience Research

RFP 4 -- ADVANCED TV STUDY

September 1989

I. Purpose

This is one of four RFPs generated by the Audience Research Working Party of the FCC Advanced Television Systems Advisory Committee Planning Subcommittee. These RFPs attempt to specify key questions about consumer responses to advanced television systems and identify appropriate and unbiased research methodologies for studying these questions. The research results will be widely and freely circulated and are intended to provide guidance to the Commission in its determination of policy and standards and to the industry which must design and implement these advanced systems.

Other RFPs in this series have focused on the impact of such variables as screen resolution, size and aspect ratio on consumer demand for advanced television systems. The purpose of this fourth RFP is to explore several other variables such as user-controlled displays and interactive video which may ultimately prove to have a significant influence on consumer interest and may interact with the fundamental dynamics of demand for higher resolution.

II. Background

It has been widely noted that new technologies (and new generations of existing technologies) seldom work out as originally planned. Marconi had conceptualized radio primarily as ship-to-shore telegraphy. The concept of commercial radio broadcasting of information and entertainment to a mass audience did not evolve until 20 years after Marconi's first demonstration of radio transmission. Likewise, Edison conceived of the phonograph as a personal dictaphone. He felt the sound quality was inadequate and impractical for recording music.

Furthermore, there have been numerous failures of new technical products because of an inadequate understanding of what consumers really valued. One thinks of AT&T's multimillion dollar losses on picturephone, the multiple failures to sell videotex services and, of course, quadraphonic sound.

The early research on HDTV conducted in Japan was based on an historical metaphor. It was felt that, like the transition from black and white to color, a new standard for television programming would soon evolve and that it would feature improved spatial resolution and a wider aspect ratio. But that metaphor may prove to be incomplete and misleading. The shift from black and white to color was a straightforward technical transition. Color was added to the broadcast signal but the basic nature of the programming, the receivers and transmitters and the number of channels available stayed the same. When color became available, there was no discussion of new types of

programming, new directorial styles or other changes in the nature of the medium. It was just television with color added.

Recently released research on consumer responses to HDTV indicates that the nature of demand is complex. Strong preferences for HDTV depend heavily on such factors as viewer expectations, screen size, viewing distance and type of programming material. One possibility which has been widely discussed is that a true take-off point for HDTV penetration will require an inexpensive non-CRT display (perhaps improved projectors or flat panel technologies) which would allow for a bright enough and large enough display and take full advantage of the improved resolution.

Another possibility is that changes in production variables associated with the way a scene is staged, framed and lit could prove to be critical to consumer acceptance. Research which ignores these potential interaction effects could lead to very misleading results. It could lead to acceptance of an inappropriate technical standard. It could lead to the false belief that there is no consumer interest in advanced television systems. Most likely, perhaps, it could lead to the design of a suboptimal and inflexible system, one based on undue faith in the color-tv metaphor and an exclusive and narrow focus on spatial resolution and aspect ratio.

There is another reason to explore other potential functionalities of advanced television. It derives from the fact that the signal processing power which is being proposed for the design of advanced television systems need not be devoted exclusively to squeezing large numbers of pixels into limited bandwidths. The chip sets for higher resolution signal processing (at a very small marginal cost) can be designed to serve other functions for the television broadcaster and viewer.

It would be inappropriate at this point to attempt to enumerate all the possible functionalities of advanced television systems. The research proposed here would be judged highly successful if it simply demonstrated the relevance to the consumer of but one or two factors other than resolution and aspect ratio. An important lesson potentially derived from such research would be the critical importance of flexibility and extensibility of advanced television systems not just a raw quantitative count of lines and pixels.

This proposed research has a somewhat different character than most of the other studies conducted to date for the Advanced Television Test Center, the FCC Advisory Committee or the constituent industrial groups. Thus far, the emphasis has been on evaluative rather than exploratory research. It was felt that the primary dimensions of evaluation were clear-cut and straightforward and that the task at hand was to evaluate proposed systems as fairly as possible to come to an expeditious setting of standards. There was a distinct sense of urgency. Thus the emphasis on evaluation of existing systems.

There are indications, however, that both the haste and narrowness of evaluative focus may be misguided. It is possible, as with the advent of picturephone and quadraphonic audio, that a hurriedly determined new standard will be met with a collective yawn by the public at large. The researchers associated with Working Party 7 (as well as those associated with Working Party 5 of the Planning Subcommittee) are professionally bound to address that question directly. But if the consumer response is modest or even mildly negative (given the costs involved) the research question need not be framed as a simplistic evaluative polarity. As the consumer research community knows full well, the question is not just, "Will product X sell?" It is, "What will make the product sell?" Thus the current proposal which emphasizes the exploratory rather than the evaluative.

III. Research Questions

The proposed research is organized around two central themes A) Flexible Advanced Systems and B) Interactive Advanced Systems. Examples of research foci are just that, examples to give the questions a concrete illustration. They are meant only to be suggestive of approaches vendors may wish to consider. They are not intended to preclude other approaches to research.

A) FLEXIBLE TELEVISION-- What aspects of user-control of television have the greatest value to consumers?

1. How important to viewers are multiple-channel screen displays, the so-called PIP -- Picture in Picture technology? How important is it that the user be able to flexibly control the window sizes and formats as in the tradition of the Mac computer? How does demand for PIP interact with screen resolution, screen size, and programming designed for PIP display? It may be, for example, that sports or dramatic programming could be designed to take special advantage of the viewers interest in a particular subset of the action on the screen. It may be this ability to control the screen and see something that "other viewers can't see" will prove to be a strong psychological driver for the implementation of advanced television. This windowing capacity may have a strong influence on consumers' judgments of aspect ratio.

2. How important is a user-controlled screen zoom? This is an extension of the previous question focusing on the ability of a viewer with a key-pad or joy-stick to zoom in on and enlarge a section of the broadcast image. How important is screen zoom to viewers' appreciation of the underlying resolution of the broadcast picture? Again, this is likely to be most relevant for sports and other specialized programming.

3. How important is hard-copy display to television viewing? Most current television programming is ill-suited for a freeze-frame hard-copy output, naturally enough.

Viewers occasionally take photographs of the screen, seldom with much success. But if high-quality hard-copy output were available with the flick of the remote button, both viewers and broadcasters might find meaningful use of the technology. Examples include advertising coupons, additional information about program content, news, or advertised products, program guides, sports programs and the like. The hard-copy output may taken off screen or be a supplemental transmission as in teletext or closed captioning. How important is hard-copy to viewer appreciation of high resolution transmission? Existing comparative research indicates that consumers are much more discriminating with regard to resolution in hard-copy than screen display.

B) INTERACTIVE TELEVISION -- What aspects of interactivity have the most value to consumers?

1. How important to the consumer are such broadcasting-related two-way services as ordering products and responding to ads and polls? Early field tests with the QUBE system in Columbus revealed a marginal success. But technical limitations and the small scale of production may have constrained the test. Is interactivity related in any way to demand for higher resolution?

2. How important to the consumer is expanded choice of programming options? The image processing technologies of HDTV can be used to extend the resolution of an existing broadcast channel or to provide additional channels of programming of current resolution through existing channels. How do viewers evaluate the trade-off of greater resolution versus greater programming choice? It may be a complex decision because flexible systems may allow some channels for which it is especially relevant to take advantage of increased resolution and for others to opt for increased choice.

3. How important is Video-On-Demand programming to viewers? The ultimate form of viewer choice and control is the ability to order up virtually any program or movie at will. The development of video-on-demand (or some evolving stages of that capacity) may prove to be intimately tied with optimal technical standards for advanced television.